

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) An apparatus for embedding imperceptible codes into digital image data comprising:

a data divider to divide, per frame, digital image data into an "N" number of fields wherein "N" being an integer of 2 or more;

a code producer to produce an N/m "m" number of combinations of imperceptible codes, each combination having an "m" number of a first imperceptible codes code and a second imperceptible code, the first imperceptible code being one of the "m" number of first imperceptible codes, the second imperceptible code being one of the "m" number of second imperceptible codes given by a function, an inverse of a specific function that gives with each first imperceptible code and a specific identification code by using the "m" number of imperceptible codes as variables, in which the specific identification code is given by the specific function with the first and second imperceptible codes of each combination as variables wherein "m" being an integer of 2 or more and given by dividing "N" by an integer; and

a code embedder to embed the N/m number of combinations of first and second imperceptible codes of each combination into image data into the "N" number of fields so that the "m" number of imperceptible codes of each combination are embedded into image data in of each of the "m" number of divided fields according to a specific rule of positional correspondence to give correlation among the "m" number of fields that defines a positional relationship between the first and second imperceptible codes of each combination when embedded in the "N" number of fields each field of one frame.

2. (Currently Amended) An apparatus for extracting imperceptible codes from digital image data, the imperceptible codes being embedded into the digital image data by dividing, per frame, digital image data into an "N" number of fields wherein "N" being an integer of 2 or more, producing an "m" number of combinations of imperceptible codes, each combination having a first imperceptible code and a second imperceptible code, the first imperceptible code being one of the "m" number of first

imperceptible codes, the second imperceptible code being one of the “m” number of second imperceptible codes given by a specific function with each first imperceptible code and a specific identification code as variables, in which the specific identification code is given by the specific function with the first and second imperceptible codes of each combination as variables wherein “m” being an integer of 2 or more and given by dividing “N” by an integer, and embedding the first and second imperceptible codes of each combination into image data of each of the divided fields according to a specific rule of positional correspondence that defines a positional relationship between the first and second imperceptible codes of each combination when embedded in each field of one frame, in which the apparatus is given information on the division condition of the digital image data divided into the “N” number of fields per frame, the specific identification code, the specific function and the specific rule of positional correspondence, the apparatus comprising:

~~a data divider to divide, per frame, input digital image data into an the “N” number of fields wherein “N” being an integer of 2 or more according to a specific rule of positional correspondence to give correlation among an “m” number of fields in the “N” number of fields of one frame wherein “m” being an integer of 2 or more and given by dividing “N” by an integer, the input digital image data carrying imperceptible codes that have been embedded into the input digital image data by dividing, per frame, original digital image data into the “N” number of fields, producing an N/m number of combinations of imperceptible codes, each combination having the “m” number of imperceptible codes given by a function, an inverse of a specific function that gives a specific identification code by using the “m” number of imperceptible codes as variables, and embedding the N/m number of combinations of imperceptible codes into image data divided into the “N” number of fields according to a specific code embedding technique so that the “m” number of imperceptible codes of each combination are embedded into image data in the “m” number of fields according to the rule of positional correspondence division condition;~~

a code extractor to extract the “N” number of imperceptible codes embedded into from the image data divided into the “N” number of fields according to a code extraction technique corresponding to the code embedding technique;

a code-pair combiner to combine the extracted "N" number of imperceptible codes into the N/m "m" number of combinations according to the division condition and the rule of positional correspondence;

a code operator to ~~execute the specific function to~~ conduct a specific operation to obtain the specific identification code by using the specific function with the imperceptible codes of each of the N/m number of combinations combination as variables; and

a determiner to determine that the input digital image data has not been tampered with only when results of the specific operation is equal to the specific identification code for all of the N/m "m" number of combinations.

3. (Currently Amended) A method of embedding imperceptible codes into digital image data comprising the steps of:

dividing, per frame, digital image data into an "N" number of fields wherein "N" being an integer of 2 or more;

producing an N/m "m" number of combinations of imperceptible codes, each combination having an "m" number of a first imperceptible codes code and a second imperceptible code, the first imperceptible code being one of the "m" number of first imperceptible codes, the second imperceptible code being one of the "m" number of second imperceptible codes given by a function, ~~an inverse of a specific function that gives~~ with each first imperceptible code and a specific identification code by using the "m" number of imperceptible codes as variables, in which the specific identification code is given by the the specific function with the first and second imperceptible codes of each combination as variables wherein "m" being an integer of 2 or more and given by dividing "N" by an integer; and

embedding the N/m number of combinations of first and second imperceptible codes of each combination into image data into the "N" number of fields so that the "m" number of imperceptible codes of each combination are embedded into image data in of each of the "m" number of divided fields according to a specific rule of positional correspondence ~~to give correlation among the "m" number of fields~~ that defines a positional relationship between the first and second imperceptible codes of each combination when embedded in the "N" number of fields each field of one frame.

4. (Currently Amended) A method of extracting imperceptible codes from digital image data, the imperceptible codes being embedded into the digital image data by dividing, per frame, digital image data into an “N” number of fields wherein “N” being an integer of 2 or more, producing an “m” number of combinations of imperceptible codes, each combination having a first imperceptible code and a second imperceptible code, the first imperceptible code being one of the “m” number of first imperceptible codes, the second imperceptible code being one of the “m” number of second imperceptible codes given by a specific function with each first imperceptible code and a specific identification code as variables, in which the specific identification code is given by the specific function with the first and second imperceptible codes of each combination as variables wherein “m” being an integer of 2 or more and given by dividing “N” by an integer, and embedding the first and second imperceptible codes of each combination into image data of each of the divided fields according to a specific rule of positional correspondence that defines a positional relationship between the first and second imperceptible codes of each combination when embedded in each field of one frame, in which the apparatus is given information on the division condition of the digital image data divided into the “N” number of fields per frame, the specific identification code, the specific function and the specific rule of positional correspondence, the method comprising the steps of:

dividing, per frame, input digital image data into an the “N” number of fields wherein “N” being an integer of 2 or more according to a specific rule of positional correspondence to give correlation among an “m” number of fields in the “N” number of fields of one frame wherein “m” being an integer of 2 or more and given by dividing “N” by an integer, the input digital image data carrying imperceptible codes that have been embedded into the input digital image data by dividing, per frame, original digital image data into the “N” number of fields, producing an N/m number of combinations of imperceptible codes, each combination having the “m” number of imperceptible codes given by a function, an inverse of a specific function that gives a specific identification code by using the “m” number of imperceptible codes as variables, and embedding the N/m number of combinations of imperceptible codes into image data divided into the “N” number of fields according to a specific code embedding technique so that the “m” number of imperceptible codes of each

~~combination are embedded into image data in the “m” number of fields according to the rule of positional correspondence~~ division condition;

extracting the “N” number of imperceptible codes embedded into ~~from~~ the image data divided into the “N” number of fields according to a code extraction technique corresponding to the code embedding technique;

combining the extracted “N” number of imperceptible codes into the N/m “m” number of combinations according to the division condition and the rule of positional correspondence;

~~executing the specific function to~~ conducting a specific operation to obtain the specific identification code by using the specific function with the imperceptible codes of each of the N/m number of combinations combination as variables; and

determining that the input digital image data has not been tampered with only when results of the specific operation is equal to the specific identification code for all of the N/m “m” number of combinations.

5. (Currently Amended) A method of embedding imperceptible codes into digital image data by a computer comprising the steps of:

dividing, per frame, digital image data into an “N” number of fields wherein “N” being an integer of 2 or more;

producing an N/m “m” number of combinations of imperceptible codes, each combination having an “m” number of a first imperceptible codes code and a second imperceptible code, the first imperceptible code being one of the “m” number of first imperceptible codes, the second imperceptible code being one of the “m” number of second imperceptible codes given by a function, ~~an inverse of a specific function that gives with each first imperceptible code and~~ a specific identification code ~~by using the “m” number of imperceptible codes as variables, in which the specific~~ identification code is given by the specific function with the first and second imperceptible codes of each combination as variables wherein “m” being an integer of 2 or more and given by dividing “N” by an integer; and

embedding the N/m number of combinations of first and second imperceptible codes of each combination into image data ~~into the “N” number of fields so that the “m” number of imperceptible codes of each combination are embedded into image data in~~ of each of the “m” number of divided fields according to a specific rule of positional correspondence ~~to give correlation among the “m”~~

number of fields that defines a positional relationship between the first and second imperceptible codes of each combination when embedded in the “N” number of fields each field of one frame.

6. (Currently Amended) A method of extracting imperceptible codes from digital image data by a computer, the imperceptible codes being embedded into the digital image data by dividing, per frame, digital image data into an “N” number of fields wherein “N” being an integer of 2 or more, producing an “m” number of combinations of imperceptible codes, each combination having a first imperceptible code and a second imperceptible code, the first imperceptible code being one of the “m” number of first imperceptible codes, the second imperceptible code being one of the “m” number of second imperceptible codes given by a specific function with each first imperceptible code and a specific identification code as variables, in which the specific identification code is given by the specific function with the first and second imperceptible codes of each combination as variables wherein “m” being an integer of 2 or more and given by dividing “N” by an integer, and embedding the first and second imperceptible codes of each combination into image data of each of the divided fields according to a specific rule of positional correspondence that defines a positional relationship between the first and second imperceptible codes of each combination when embedded in each field of one frame, in which the apparatus is given information on the division condition of the digital image data divided into the “N” number of fields per frame, the specific identification code, the specific function and the specific rule of positional correspondence, the method comprising the steps of:

~~dividing, per frame, input digital image data into an the “N” number of fields wherein “N” being an integer of 2 or more according to a specific rule of positional correspondence to give correlation among an “m” number of fields in the “N” number of fields of one frame wherein “m” being an integer of 2 or more and given by dividing “N” by an integer, the input digital image data carrying imperceptible codes that have been embedded into the input digital image data by dividing, per frame, original digital image data into the “N” number of fields, producing an N/m number of combinations of imperceptible codes, each combination having the “m” number of imperceptible codes given by a function, an inverse of a specific function that gives a specific identification code by using the “m” number of imperceptible codes as~~

~~variables, and embedding the N/m number of combinations of imperceptible codes into image data divided into the “N” number of fields according to a specific code embedding technique so that the “m” number of imperceptible codes of each combination are embedded into image data in the “m” number of fields according to the rule of positional correspondence~~ division condition;

extracting the “N” number of imperceptible codes embedded into ~~from~~ the image data divided into the “N” number of fields according to a code extraction technique corresponding to the code embedding technique;

combining the extracted “N” number of imperceptible codes into the N/m “m” number of combinations according to the division condition and the rule of positional correspondence;

~~executing the specific function to~~ conducting a specific operation to obtain the specific identification code by using the specific function with the imperceptible codes of each of the N/m ~~number of combinations~~ combination as variables; and

determining that the input digital image data has not been tampered with only when results of the specific operation is equal to the specific identification code for all of the N/m “m” number of combinations.